Appendix N – Testing and Statistical Analyses

Precision: Precision denotes the amount of agreement between repeated measurements by the same observer and/or different observes. It reflects both the expertise of the observers and the rigor of the procedure. We tested precision by evaluating repeat samples at the same sites and at the same time. We tested repeatability among the same observers and between different observers on the same reaches of stream. Observers were instructed to complete a sample at the site, and then to repeat sampling at the same site. Because plots are located at random by pacing, the likelihood of the repeat sample plots being placed at exactly the same locations on the greenline as samples taken during the initial run is low. Therefore, spatial variation may represent some of the differences observed between initial and final samples (spatial variation is described in the section on Accuracy, below). The following summarizes the ranges of variability observed both among and between observers.

Indicator	**Number of tests**	**Number of streams tested**	**Mean difference & range of differences among the same observers**	**Mean difference & range of differences between different observers**
Stubble Height	35	6	0.6 (0 – 1.5) inch	0.8 (0 – 4.5) inch
Bank alteration	35	6	4.8 (0 – 15)%	8.2 (0 – 44)%
Woody utilization (browse)	33	5	6.3 (0 – 40) %	11.1 (0 – 40)%
Bank Stability	35	6	6.3 (0 – 19)%	12.4 (0 – 40)%
% Hydic vegetation	35	6	5.5 (0 – 18)%	9.3 (.5 – 31)%
Wetland rating	35	6	4.9 (0 – 22)	12.1 (1 – 53)
Greenline-greenline width	35	6	.29 (0 -1.7) meters	.56 (.02 – 1.52) meters

Accuracy: Accuracy is the amount of agreement between the estimate from sampling, and the true mean value, usually reflecting the number of samples collected and spatial variability at the site. Sample size estimates are used to evaluate accuracy. We estimated the number of samples needed using a standard power analysis to predict the mean based on the standard normal coefficient, the measured deviation from the mean, and a desired confidence interval width, as follows:

n = (Zæ)2(s)2 / (B)2

Where:

n = The sample size needed to accurately predict the mean.
Zæ = The standard normal coefficient.
s = The standard deviation.

B = The desired confidence level expressed statistically as half of the maximum acceptable confidence interval width. This needs to be specified in absolute terms rather than as a percentage. For example, if the desired confidence interval width is to be within 30% of the sample mean and expected mean = 10, then B = (0.30 x 10) = 3.0.

The standard deviation and the confidence level representing a percentage of the mean value can be calculated from data as it is being collected in the field. Consequently, we have added this equation to the Data Entry Module, in EXCEL, so that users can input data and assess sample size needed as it is being collected in the field. The module contains a cell in the Header spreadsheet that allows users to modify the confidence level as they evaluate desired sample sizes from their data.

Observed n values from test data: Using the observed standard deviations from test data, the following describes the average sample size needed to predict the mean.

Sample size needed to predict the mean with 85% confidence (values in parenthesis are the numbers of plots from which the standard deviation was calculated).

SITE	**Bank Alteration**	**Bank Stability**	**Stubble Height**	**Greenline-Greenline Width**	**Woody Species Utilization**
Marks Creek	57 (379)	9 (44)	45 (372)	51 (423)	201 (107)
Long Tom	31 (310)	28 (301)	17 (186)	29 (301)	64 (415)
Shoshone Cr	42 (285)	33 (125)	29 (124)	15 (281)	206 (103)
NF Humboldt	27 (355)	25 (86)	34 (206)	29 (361)	84 (79)
Big Elk Cr	8 (228)	32 (53)	18 (56)	43 (228)	317 (135)
Average	**33**	**25.4**	**28.6**	**33.4**	**174.4**

Sample size needed to predict the mean with 90% confidence (values in parenthesis are the numbers of plots from which the standard deviation was calculated)

SITE	**Bank Alteration**	**Bank Stability**	**Stubble Height**	**Greenline-Greenline Width**	**Woody Species Utilization**
Marks Creek	127 (379)	21 (44)	122 (372)	114 (423)	451 (107)
Long Tom	70 (310)	62 (301)	39 (186)	65 (301)	144 (415)
Shoshone Cr	95 (285)	74 (125)	65 (124)	34 (281)	464 (103)
NF Humboldt	61 (355)	55 (86)	77(206)	64 (361)	188 (79)
Big Elk Cr	19 (228)	71 (53)	40 (56)	98 (228)	714 (135)
Average	**74.4**	**56.6**	**68.6**	**75**	**392.2**

Using the test data and assuming that 80 plots are sampled at each site, following are the calculated confidence levels from the test data.

Bank Alteration	**Bank Stability**	**Stubble Height**	**Greenline-Greenline Width**	**Woody Species Utilization**
93%	96%	95%	96%	70%

APPENDIX O – Equipment List

The following equipment is needed to use the monitoring protocol.

- Monitoring frame described in Appendix D.
- Waders or wading shoes are useful. It is easier to monitoring many streams by pacing in the stream rather than on the streambank.
- Laser rangefinder, measuring rod, or tape measure. The laser range finder is expensive ($2,400.00 for one with a precision of ±0.03 meters and about $800.00 for one with a precision of ±0.3 meters), but is about 50 percent more efficient.
- Measuring rod or tape measure (metric preferred)
- Handheld computer (PDA) with Excel spreadsheet. Extra batteries or extended life batteries are required.
- Riparian monitoring data sheets.
- Global Positioning Position (GPS) receiver with extra batteries.
- Appropriate plant identification keys for riparian plants.